Demonstration of dual-band infrared thermal imaging at Grass Valley Creek Bridges

Nancy K. Del Grande, Philip F. Durbin and Paul C. Schaich
Lawrence Livermore National Laboratory
P. O. Box 808, Livermore, CA 94550
tel: (510) 422-1010; fax: (510) 422-3834; e-mail: delgrande1@llnl.gov

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ABSTRACT

We demonstrated the dual-band infrared (DBIR) thermal imaging method to inspect Grass Valley Creek Bridges near Redding CA during November 2-3, 1995. We designed and fielded a mobile DBIR bridge inspection laboratory. We drove this self-contained unit at limited highway speeds over 0.4 lane miles of bridge deck. Infrared thermal imaging depicts delaminations and clutter. Clutter is unwanted thermal detail from foreign material and uneven shade on the bridge deck. By mapping the DBIR thermal imaging spectral differences at 3-5 μm and 8-12 μm, we tag and remove foreign material clutter. By mapping the deck daytime minus nighttime (diurnal) temperature differences, which vary inversely with thermal inertia, we tag delaminations unaffected by shade. Thermal inertia is a bulk deck property, i.e., the square root of thermal conductivity x density x heat capacity. Relative to undamaged decks areas, delaminated deck areas were typically 2 or 3 °C warmer during the day and 0.5 °C cooler at night. DBIR thermal imaging is an enabling technology for rapid, reliable, bridge deck inspections while minimizing lane closures. This technique is expected to help bridge managers prioritize bridges for repair. The mobile DBIR bridge inspection laboratory is currently undergoing extensive testing to examine bridges by the Federal Highway Administration.

Key Words: Dual-Band Infrared Bridge Inspections

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